ICDP DSeis 5: Diametrical Core Deformation Analysis of the M5.5 aftershock zone core - stress concentration at reflective intrusives and transition in stress regimes.

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ICDP drilling into the aftershock zone of the 2014 M5.5 earthquake near Orkney, South Africa commenced on 2017 and was completed in 2018. Drilling was designed to minimize damage on core and borehole, being able to maximize core recovery. Hole A (817m) was drilled in 2017. It unfortunately didn't intersect the M5.5 fault, running eventually sub-parallel and roughly 100m from the aftershock zone. As the hole was stable we could recover almost 100% of core from the area traversing the periphery of the M5.5 aftershock zone for a distance of several hundreds of meters. Ishida et al. (2018) carried out Diametrical Core Diameter Analysis (Ito and Funato, 2017). This analysis measures the change in core diameter with roll angle around the core axis, which was caused by a relief of anisotropic stress during drilling. We used this analysis because (1) the expected stress was too high for hydrofracturing method, (2) uncertainty in stress magnitude is unavoidable in damage interpretations, (3) DSeis hole were too long for overcoring technique, and (4) DCDA is non-destructive and very easy to make if core is recovered. Ishida et al. (2018) measured 186 pieces of core from Hole A (817m collared at 2.9km depth) that were recovered near the M5.5 aftershock zone. They successfully illustrated spatial variation in differential stress in a plane perpendicular to Hole A axis. They found stress concentration at intrusives with one located at the depth of the upper fringe of the M5.5 aftershock zone. We carried out additional measurement for the remaining part of Hole A and Hole B. With additional data measured at adjacent locations, we could confirm that the stress concentration Ishida et al (2018) found at intrusives was not an outlier. We will report how Hole B that intersected the M5.5 fault differ from Hole A stress.

This is one of nine ICDP DSeis papers (ICDP DSeis 1-9) presented in JpGU 2019. Refer other papers for other topic on drilling, logging, other stress measurement, fault materials, comparison with calculated stress, legacy 3D seismic reflection data, and relocated aftershocks.

